

Claims

1. Filters consisting of filter paper or paper-type nonwoven material which partially or wholly consist of fibrous material containing cellulose, characterized in that the cellulose-containing material is at least partially carbamided with urea and phosphorylated with phosphoric acid or ammonium phosphate until a nitrogen content in the form of carbamide groups of from 1 to 4% and a phosphorus content of from 3 to 8% is reached.

2. A method for producing filter paper or paper-type nonwoven material from fibrous, cellulose-containing material for filters according to claim 1, characterized by the following steps of the method:

- (a) Activation of the cellulose-containing material by adjusting it to a moisture content of 30 to 100% and maintaining said moisture content for the duration of at least one hour.
- (b) Addition of phosphoric acid or ammonium phosphate in an amount of 1 to 8 mols per kg anhydrous, cellulose-containing material.
- (c) Addition of urea at a molar ratio of urea to phosphoric acid or ammonium phosphate of 2.5:1 to 4.5:1.

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(d) Mixing of the components urea and phosphoric acid or ammonium phosphate with the activated, cellulose-containing material until the components are uniformly distributed.

(e) Evaporation of the moisture contained in the mixture formed according to process steps (a) to (d) by heating the mixture to a temperature of 60° to 100°C while simultaneously applying a vacuum.

(f) Execution of a phosphorylating and carbamidizing reaction by heating the mixture to a temperature of 125° to 145°C while simultaneously applying a vacuum, maintaining a reaction time of from one to four hours; and

(g) cooling of the reaction product to the normal temperature and washout of the impurities.

3. The method according to claim 2, characterized in that for activating the cellulose-containing material, a predetermined amount of water is added to it.

4. The method according to any one of claims 2 and 3, characterized in that the phosphoric acid or ammonium phosphate is added to the activated, cellulose-containing material first and uniformly distributed, and the urea is added subsequently.

5. The method according to any one of claims 2 to 4, characterized in that the mixing times for admixing the phosphoric acid or ammonium phosphate and the urea each amount to at least 15 minutes.

6. The method according to any one of claims 2 to 5, characterized in that the reaction components phosphoric acid or ammonium phosphate and urea are mixed with the cellulose-containing material at room temperature.

7. The method according to any one of claims 2 to 6, characterized in that phosphoric acid or ammonium phosphate and/or urea are mixed with the amount of water intended for the activation, and the solution so obtained is mixed with the cellulose-containing material for the activation.

8. The method according to claim 7, characterized in that the mixing of the phosphoric acid or ammonium phosphate and/or urea with the water is carried out under heating to temperatures of up to 60°C.

9. The method according to any one of claims 7 or 8, characterized in that prior to the activation, the cellulose-containing material is heated to the temperature of the solution of urea and/or phosphoric acid or ammonium phosphate in water.

10. The method according to any one of claims 2 to 9, characterized in that the cellulose-containing material is formed by a mixture of different materials.

11. The method for producing filter paper or paper-like nonwoven material from cellulose-containing fibrous material according to claim 1, characterized by the following steps of the method:

- (a) Production of cellulose-containing filter paper or paper-like nonwoven material in the form of a web- or leaf-shaped starting material in the manner known per se;
- (b) treatment of the starting material obtained according to process step (a) with a solution of urea and phosphoric acid and/or ammonium phosphate in water at a molar ratio of urea to phosphorus of 2.5:1 to 4.5:1, whereby the amount of water is adjusted in such a way that 1 to 8 mols phosphorus per kg cellulose remain in the cellulose-containing starting material;
- (c) a subsequent vacuum treatment and heating of the starting material to a temperature of from 60° to 100°C in order to completely expel the water;
- (d) execution of a phosphorylation and carbamidation reaction of the starting material treated according to process steps (b) and (c) at a temperature of

from 125° to 155°C under vacuum in the course of a reaction time of at least 15 minutes; and

(e) subsequent cooling and washing free of phosphate and final drying of the treated starting material.

12. The method according to any one of claims 2 to 11, characterized in that the applied vacuum is adjusted to a value of 50 to 200 Torr.

13. The method according to any one of claims 1 to 12, characterized in that prior to washing and drying, the phosphorylated and carbamided cellulose-containing fiber material is converted from the ammonium form into the sodium form by treating it with a solution of common salt.

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